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PSYCHE

Vol. 64 June, 1957 No. 2

TERTIARY FLIES FROM COLORADO AND THE BALTIC AMBER[1]

By Frank M. Hull

University of Mississippi

I wish to thank Dr. Frank M. Carpenter of Harvard University for the opportunity to study the following two species of most interesting fossil flies. The asilid from the Miocene shales of Colorado is particularly interesting because of the information that it affords as to the narrow extent of change in Recent related flies. The syrphid in Baltic amber represents the third species belonging to its genus and is unusually well preserved. Both are from the collections of the Museum of Comparative Zoology.

Senoprosopis romeri, new species

Plate 2

A slender asilid with elongate, attenuate abdomen, extending considerably beyond the wing, and belonging to the subfamily Asilinae. All of the femora are moderately stout without being swollen. Bristles on the legs prominent, short and stout. Length 25 mm.

Head: The head is well preserved, except for the antenna. Face quite short, more prominent below due to the recession of the eye. The whole face is very gently convex. Occiput prominent, no details of pile or bristles are present on the head. *Thorax*: The mesonotum is moderately high and arched, equally convex in front and behind. There are clear indications of scanty, scattered, moderately long, appressed, bristly setae which appear on the notopleuron area and with equally short elements on the dorsocentral area behind the suture. Lateral elements are not clearly discerned. The whole thorax is relatively short and high, the height at least equal to the length. *Legs*: The femora are clearly preserved and are stout without being swollen. Posterior femur longer than the anterior pair and slightly narrowed at the base. Both the femora and tibia are densely covered with rather long, coarse, finely pointed, flat appressed setae on the dorsal, lateral and anterior surfaces. The tibiae similarly covered. Bristles are short but stout. The hind femur has 3 lateral bristles distributed along the middle. The apex is not preserved. The middle femur shows 2 or 3 anterior bristles, the hind femur bears 1 stout bristle medially near the base. Middle femur also with 3 prominent, ventral bristles distributed along the middle. Hind tibia stout and slightly wider toward the apex and of nearly the same length as the hind femur. It is comparatively well preserved with at least 2 prominent, dorsal bristles, 1 near the basal third, 1 near the apical fourth and the latter bristle with a matching ventrolateral bristle. Hind basitarsus stout. The middle tibia densely pilose but without bristles showing. The anterior femur shows no bristles but the corresponding tibia has 1 very stout, posterior, apical bristle, another quite long, arising from near the middle, besides, also 2 long, slender, bristly hairs on the basal third. Tarsal bristles stout but short. Claws sharp, bent chiefly at the apex, black with the base lighter colored. Pulvilli well developed. *Wings*: The wings are hyaline with the apical fourth darker, apparently due to villi. Marginal cell closed with a moderately long stalk; the second submarginal cell is comparatively narrow, developed almost entirely in front of the third vein and at the apex it is only moderately flared. The anterior branch of the third vein ends quite at the

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[1] Published with the aid of a grant from the Museum of Comparative Zoology at Harvard College.

Explanation of Plate 2

Photograph of *Senoprosopis romeri* n. sp. (Holotype, Florissant shales, Colorado, no. 5125, Museum of Comparative Zoology). Length of specimen 25 mm.

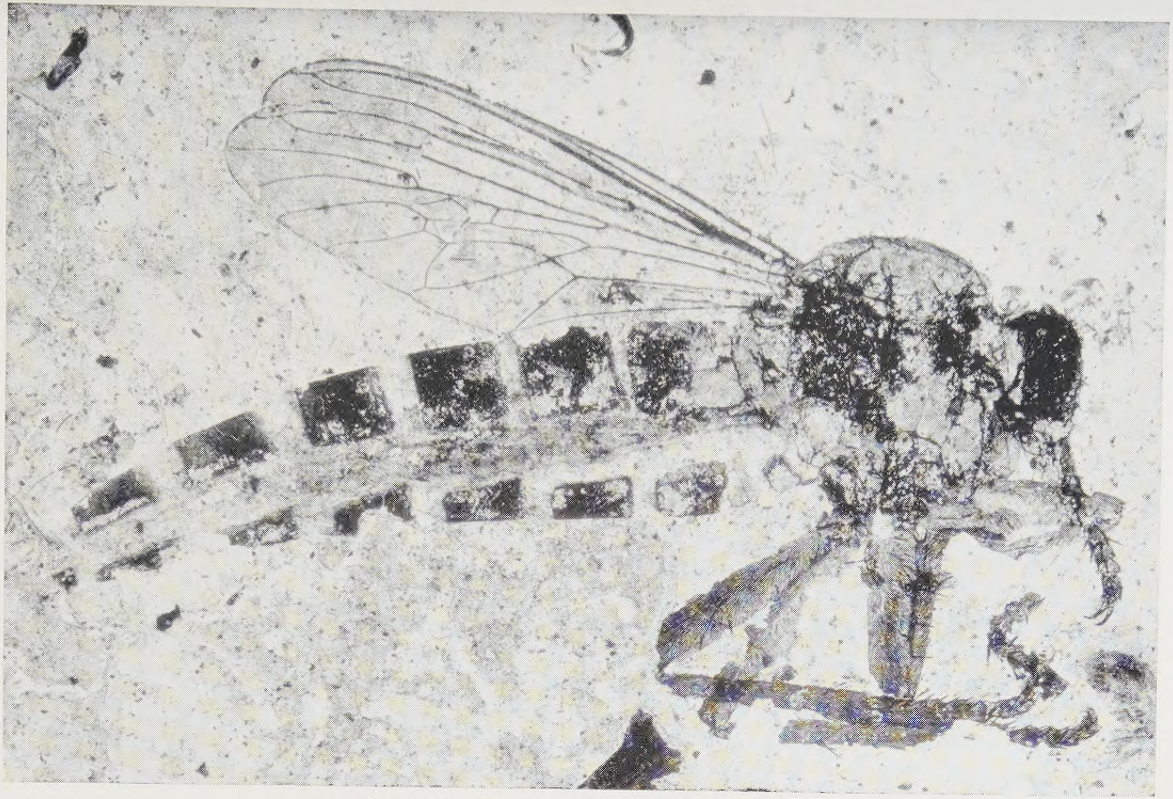

Plate 2. Hull — *Senoprosopis romeri*

apex of the wing, the posterior branch ends well behind the apex by a distance double the middle width of the second submarginal cell. The first, second and third posterior cells open maximally. Fourth closed with a moderately long stalk and the end vein of the fourth posterior cell outwardly convex. Also the upper vein of this cell also strongly convex, tending to occlude the discal cell. Anterior cross vein oblique, entering the discal cell a little beyond the middle. Posterior crossvein absent, upper anterior intercalary vein twice as long as the medial crossvein. Anal vein closed and stalked. *Abdomen*: The abdomen is elongate, considerably longer than the wing. It is well preserved and shows 7 tergites and 8 sternites. Apparently a female, the third to seventh tergites are of nearly equal length and while there is clear preservation of slender, postmarginal fringes of long, bristly hairs, rather widely separated, there is no evidence of distinct bristles. The sternites show clearly and are well preserved and their pile appears to have been extremely delicate. At only one point is there an indication of a sternal hair and certainly bristles were absent.

Type. Female; Miocene, Florissant, Colorado, no. 5125 in the Museum of Comparative Zoology. Named in honor of Director A. S. Romer.

This species is very close to the species *Senoprosopis antiquus* James, the wing of which was figured by James, 1939. It differs from it in the more extensive narrowing in the middle of the first posterior cell, which in *S. romeri* is clearly narrowed to less than half its maximal width, and also in the more straightened apical portion of the third vein.

I have examined the types of all Recent New World species placed in *Senoprosopis* Macquart; all differ to some extent from the clear profile drawing of the head shown by Macquart, of his type of genus, *Senoprosopis diardii*

Explanation of Plate 3

Photograph of *Pseudosphegina carpenteri* n. sp. (Holotype, Baltic amber, no. 5124, Museum of Comparative Zoology). Length of specimen 5.6 mm.

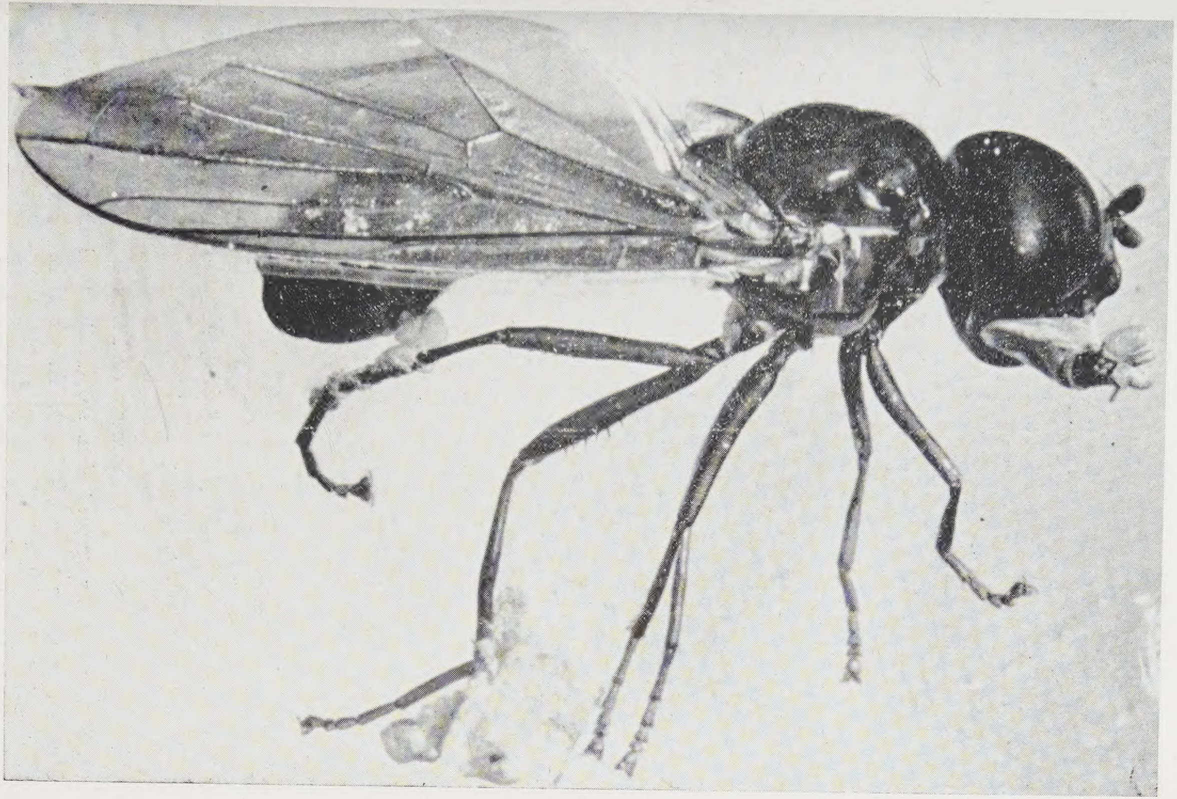

Plate 3. Hull — Pseudosphegina carpenteri

Macquart, which was from India, and which I have not seen. I therefore leave the New World species provisionally in *Senoprosopis;* all of these New World species have a distinct, rather long petiole at the base of the fourth posterior cell, in contrast to the two Florissant species and for this reason I propose the subgeneric name *Eosenoprosopis* for these two species with *S. romeri* as type of subgenus. As far as the second submarginal cell is concerned, the two fossil species agree better with *Opopotes* Hull, a Recent Costa Rican species, in which the anterior branch of the third vein ends clearly at the apex, and not a short distance above the apex as in the South American species of *Senoprosopis. Opopotes* is further characterized by the remarkably attenuate third antennal segment, 2 segmented, rather short styles; this may be the genus represented by the figure labelled *Senoprosopis* sp., in Curran's *The Families and Genera of North American Diptera,* 1934.

These two Florissant species give a very nice indication of the slight degree of change, at least as far as the wing is concerned, between Miocene and Recent species.

Pseudosphegina carpenteri, new species

Plates 3[2] and 4

Length 5.6 mm.

Male. *Head*: Eyes almost touching above the front, the ocelli form an isosceles triangle. Face with a well developed tubercle situated a little below the middle of the face. Antenna set a little above the middle of the head in profile, the first 2 segments quite short, each with

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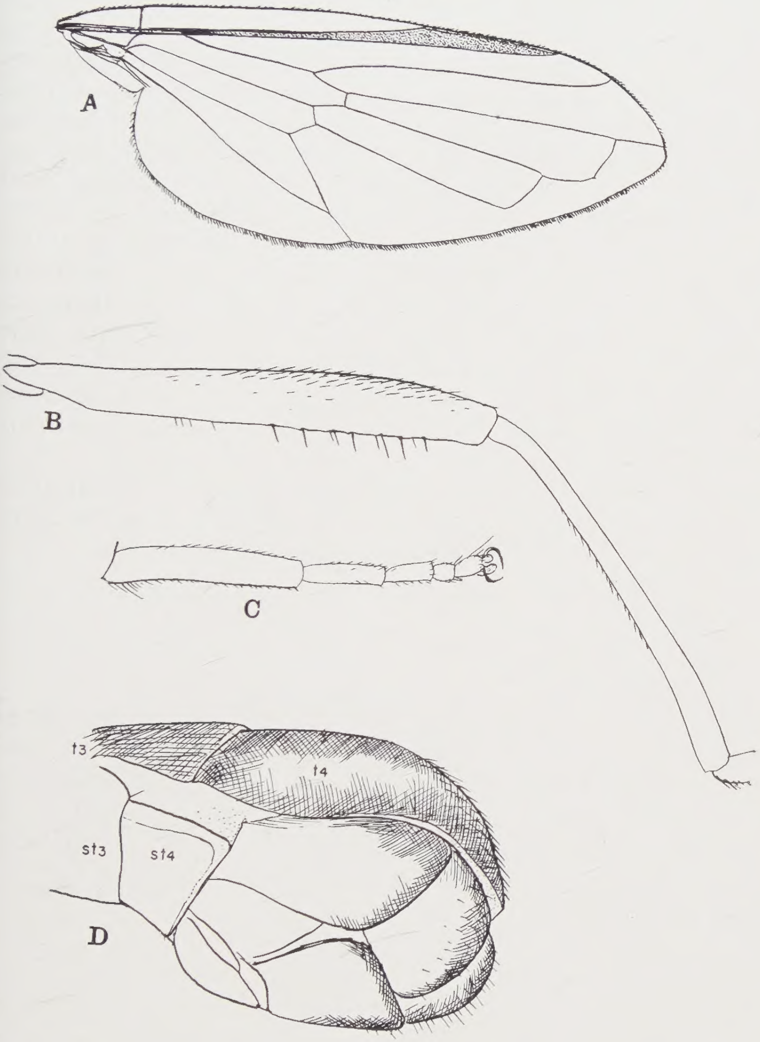
[2] For a colored photograph of this specimen, see cover of Scientific American, November, 1951.

Explanation of Plate 4

Pseudosphegina carpenteri n. sp. (Holotype, Baltic amber, no. 5124, Museum of Comparative Zoology). A. wing. B. Proximal segments of metathoracic leg. C. Distal segments of metathoracic leg. D. Posterior part of abdomen: t3, t4, 3rd and 4th tergites; st3, st4, 3rd and 4th sternites.



HULL — PSEUDOSPHEGINA CARPENTERI

a prominent, ventral bristle, the second segment with a dorsal seta and the third segment short, oval with rather blunt apex. The arista is slender, basally thickened and one and a half times as long as the third segment. Front with scanty, fine, erect pile which is rather short. Face without pile. The occiput concave and sunken, the posterior margin of the eye prominent for a short distance behind the head. *Thorax*: The thorax is a little longer than wide and rather strongly convex. It is relatively bare with a few, scattered, suberect, stiff hairs on the anterior half in front of the suture and similar, still more scanty pile behind. Scutellum rather large, convex with a few fine, erect hairs of the disc and 2 pairs of rather prominent, comparatively long, moderately stout, marginal bristles. *Legs*: The legs are slender, the hind femur quite slender with 4 ventral setae on the basal half and a double row of quite sharp, erect, spinous, non-tuberculate bristles placed ventrolaterally and ventromedially on the outer half of this femur. The outer row contains 4 elements of about the same length and 3 smaller ones interspersed. The medial row contains 3 which are stout, and like the larger elements on the lateral portion. Hind tibia as long as the femur, quite slender with minute, fine, appressed, quite inconspicuous pile. Tarsi also slender, the basitarsus as long as the remaining segments, the second segment a little longer than the next 2, the third segment nearly twice as long as the fourth segment. Tarsal pile similar to that of the tibia, the ventral fringe quite short and also fine, and the apices with scarcely longer hairs, except on the ultimate segment, where there are 2 stiff, dorsal hairs side by side, which are nearly as long as this segment. Claws extremely fine, curved from the base and sharp, the pulvilli well developed. Middle femur with a posterior fringe of pile in which, however, the individual hairs are not very long. Apical bristles of the middle tibia are quite small and weak, middle basitarsus slightly longer than the next 2 segments, the other segments also progressively reduced. Anterior legs with extremely short, inconspicuous, fine, scanty pile, their basitarsus about as long as the next 2 segments and the whole tarsus shorter than the middle tarsus. *Wings*: The wings are pale brownish hyaline, a little darker in the costal cell. The stigma and whole subcostal cell much darker and light reddish brown. Marginal cell open by more than one and a half times the maximal width of this cell. Third vein perfectly straight. Anterior crossvein short, rectangular and situated quite close to the base of the discal cell. First posterior cell ends remotely from the wing apex by a distance equal to the subapical crossvein or end vein of first posterior cell. At the lower corner of the first posterior cell there is almost no trace of a spur vein and none whatever of the lower corner of the discal or second posterior cell. The fourth vein along the upper margin of the discal cell is almost entirely straight, barely curved apically. The apical petiole of the discal cell is fully as long as the subapical crossvein. Anal cell closed with quite a long stalk, whole wing villose, alula present but narrow. *Abdomen*: The abdomen is clavate, gradually and slightly narrowed towards the base, the hypopygium especially large. While well preserved, the abdomen is partly covered by wings. The first 3 sternites are light yellow, the fourth is dark reddish brown with lighter posterior margin, especially laterally; the first 3 sternites have a few, scattered, fine hairs; the fourth has numerous, stiff, subappressed hairs. Hypopygium apically with a few fine, erect, short hairs. Only the last tergite shows to advantage and it is much longer medially than laterally, tending to cover largely the long, bulbous, ventral hypopygium. It is dark, reddish brown in color with abundant, short, coarse, subappressed setae. Apparently the base of the third tergite is lighter in color.

Type. Male; Lower Oligocene, Baltic amber, no. 5124, in the Museum of Comparative Zoology. This interesting species is named in honor of Dr. Frank M. Carpenter.

THE ORGANIZATION OF A NUPTIAL FLIGHT OF THE ANT *PHEIDOLE SITARCHES* WHEELER

By E. O. Wilson

Biological Laboratories, Harvard University

Introduction. Most published information on the sexual behavior of ants relates solely to the inception of the nuptial flights, with very little being recorded of the behavior of the individual reproductive forms during the main part of the flights. The reason for this important gap in our knowledge is plain — in the great majority of ant species the reproductives scatter widely after leaving the nest, fly moderate to long distances, and finally mate in nuptial swarms far above the head of the human observer.

The nuptial flight is of more than ordinary interest to the student of social insects. It is here that the male ants exhibit, both in the formation and maintenance of the swarms and in subsequent copulatory movements, the greater part of their lifetime social behavior. Both sexes display fixed-action patterns, conceivably complex in nature, that appear only at this time and are apt to be among the most stereotyped and species-specific of the entire species' repertory. Judging from other animal groups in which the reproductive behavior is better known, the nuptial flight patterns of ants can be expected to have at least four essential adaptive features, which can be summarized as follows: synchronization and coordination of flight movements within the species, intraspecific sexual stimulation to copulatory levels, exclusion of other species from the final swarming and copulatory activity, and regulation of the species dispersal rate. Descriptions of nuptial flight behavior should include, among other things, information bearing on these topics.

Observations. During field work in New Mexico in the summer of 1952, the author had an unusual opportunity to observe a nuptial flight of the small myrmicine ant *Pheidole sitarches.* The flight occurred on August 9 near Datil, Catron Co., in an abandoned homesite surrounded by sparse juniper woods. The area, normally very dry, had received a moderate rain during the afternoon, so that the upper layers of soil were moistened, and in the late afternoon, when the flight was in progress, the sky was still overcast. The flight was in full swing when first encountered at about 5:00 p.m., and it persisted, with little or no decline, until nightfall, at about 7:30 p.m.

Three swarms developed in the homesite area. Each hovered over a conspicuously bare spot in the weed-grown yard, in particular a garbage pit, the corner of a collapsed stone wall, and a pile of rotting wood. Only the swarm above the garbage pit persisted throughout the observation period; the other two did not form until about 7:00 p.m. The swarms were roughly circular in shape and highly variable in size, containing at various times from approximately fifty individuals to none at all, and ranging in diameter up to about six feet. Their centers were usually located from five to six feet from the ground but occasionally shifted temporarily under the force of the wind to as low as a few inches from the ground surface or as high as ten feet from the ground. The attraction of the swarms to the bare spots mentioned was absolute. Occasional gusts of wind shifted the ants away or dispersed them altogether, but they quickly re-gathered in a swarm over the original spot.

Males made up the bulk of the swarms. These hovered more or less stationary and facing in an upwind direction when the wind was blowing, but flew zig-zag back and forth within the limits of the swarm when the air was relatively quiet. New individuals were constantly approaching from various directions out of the nearby juniper woods, while older members of the swarm were simultaneously being blown away downwind or dropping out as they successfully mated with queens, so that the membership of the swarm was always turning over. The origin of the males was not determined, but very likely they were emerging from nests in the near vicinity. Two nests of *sitarches,* containing mature males, were found in the juniper woods within forty feet of the swarms. The males of the garbage-pit swarm seemed to appear in four principal "waves" during the observation period.

Females flew in slow, even circles through the swarms of males. No more than five were seen in a single swarm at a given time. Each persisted only several minutes or less (in one case, five minutes) before being mounted by a male and dropping from the swarm. The complete act of mating was observed on six occasions. In each case the male seized the female from above, whereupon both ceased flying and spiralled to the ground together. Upon reaching the ground, and not before, the male inserted its genitalia, taking from several seconds to nearly a minute to complete the act. After attachment, the male remained perfectly immobile, while the female either remained immobile or (on two occasions) proceeded to walk slowly over the ground. The male remained attached for one to two minutes and was finally dislodged by the female, who doubled up and pushed the male away with her head or (in one case) pinched the male's abdomen gently until it released its hold.

On two other occasions the pair broke apart while falling from the swarm, thus thwarting copulation. In both cases the separated individuals immediately took flight again upon reaching the ground, or at least attempted to do so. It is interesting to note at this point that occasionally females would light on the observer's shirt when he stood too near the swarm. The males in the swarm made no attempt to approach them under these conditions, and it was clearly necessary for them to re-enter the swarm in order to be successfully mated.

Following successful copulation, the males did not attempt to fly again but walked about on the ground, soon to fall prey to the legions of *Conomyrma pyramica* workers that were foraging everywhere in the vicinity. Some of the females may have also succumbed to the attacks of the *Conomyrma* workers, but this was never observed. Immediately after copulation those that were followed by the observer proceeded to walk along at a steady but unhurried pace until they encountered a pebble or blade of grass under which they could conceal themselves. Dealation thereafter followed, the female drawing her hind legs, one at a time, forward against the wings until the latter broke off. After dealation, the females continued to run over the ground, evidently in search of a permanent nest site. One dealate queen was found lodged in a cavity under a small rock within the homesite area.

Discussion. Several principal conclusions can be drawn from the above observations:

(1) It is almost certain that the individuals comprising the swarms were drawn from multiple nests. Incoming males were seen to approach from many directions. Moreover, it does not seem possible that all of the males in the individual swarms, which were changing in membership constantly, could have been supplied by a single nest. *Pheidole sitarches* apparently does not form very large colonies; those near the nuptial flight area appeared to contain no more than two or three hundred workers and could not have supported many more males at maximum capacity. It is likely that the swarms were formed originally by individuals attracted to the open spots in the homesite area, and thereafter the swarms, oriented to these spots, served as the principal attractant foci for individuals flying in from the outside. Mixed swarms, of course, result in genetic outcrossing and increased population variability, processes that are generally of positive adaptive value.

(2) The *sitarches* flight is of such a highly specific and transitory nature as to seemingly insure that other *Pheidole* species occurring in the same area are excluded. Nearly all of the females reaching the swarm are quickly fertilized. Moreover, each female is fertilized by only one male, thus limiting the potential genetic diversity of single colonies.

(3) The nuptial behavior is also of such a nature as to limit greatly the dispersal power of the species. It is probably true that in some species of ants the fertilized queens continue flying after leaving the nuptial swarm, thereby increasing their dispersal potential, especially if they fly upward and are caught in upper air currents.

But in *Pheidole sitarches* the female is fecundated on the ground directly beneath the nuptial swarm and does not attempt to fly afterward. It is clear that in a single generation this species is able to increase its range only by that distance over which the males form swarms away from their home nests. This limiting phenomenon may be more common in the Formicidae than previously realized. It will be recalled that ants generally have effected little dispersal to isolated oceanic islands. Polynesia, for instance, contains an extremely sparse endemic fauna, while the sharp diminution of the endemic Melanesian fauna from New Guinea eastward suggests that ants in this part of the world have relatively limited dispersal powers. Another line of evidence is that some ant species in Melanesia with flightless, ergatoid queens (e.g., *Leptogenys diminuta, L. foreli*) have dispersed farther through the outer archipelagoes than most stocks with normal winged queens. Furthermore, some of the most widely distributed groups with winged queens (e.g., *Colobopsis, Turneria*) are arboricolous and could conceivably have been carried about as entire colonies in storm-blown twigs and branches. Further study may show that ants are generally limited in dispersal powers because of peculiarities in the organization of the nuptial flight similar to those described here for *Pheidole sitarches.*

A REVISION OF THE NEARCTIC SPECIES OF *TOMODERUS* (COLEOPTERA: ANTHICIDAE)

By F. G. Werner

University of Arizona, Tucson

The Nearctic species of *Tomoderus* are very similar to each other in general appearance and present a perplexing problem both taxonomically and nomenclatorially. When Say described the first species, *constrictus,* he mentioned that the elytra had "regular series of impressed punctures." La Ferté did not see any of Say's specimens but did have a series in which the elytra were "finement et irrégulièrement ponctuées." For this series he proposed the name *interruptus.* Casey segregated specimens in his series under the two names already in use on the basis of whether the punctures became "abruptly coarse and distinctly seriate in basal third or fourth" of the elytra or "very gradually coarse and confusedly subserial in arrangement toward base." In addition he described a third species, *impressulus,* on the basis of a series with a broader anterior lobe of the prothorax, a feeble median canaliculation on this lobe and other differences.

Subsequent students of the Anthicidae have used these three names and some have been able to identify three species by using Casey's key. I have been unable to use it except to segregate specimens of *impressulus.* The identified specimens I have seen of the other two are generally referred to *constrictus* if the elytra are markedly paler at the base and to *interruptus* if the pale area is more diffuse. Specimens with the elytra entirely pale do not fit either description very well but are most easily referred to *constrictus.*

My own investigations have convinced me that the distinction in the arrangement of the elytral punctures does not exist. The punctures appear larger and deeper in pale areas but are no different from those in other specimens in which the same area is dark. The more conspicuous they are, the easier it is to imagine that they are more nearly serially arranged. The distinction is, at best, a subtle one.

An examination of the genitalia of the males indicates that four, not three, very different species occur in the United States, of which *impressulus* alone is externally distinct. Even this last species is not always very obvious. Specimens of all four vary from pale, through dark with the base of the elytra pale, to all dark.

A nomenclatorial problem immediately presents itself. Both Say and La Ferté very obviously described species of *Tomoderus.* Say's type specimens have certainly been lost. La Ferté's type series of five specimens may still remain in his collection and he mentions a dozen more in the Dejean collection, sent by LeConte. There is every chance that these series are mixed and it would be necessary to dissect any males and decide on one as a lectotype. Both the La Ferté and the Dejean collection are under the care of the Paris Museum and such an examination is not possible without a visit there.

I have therefore decided to assign the names *constrictus* and *interruptus* to our two most abundant species, without formal designation of neotype and lectotype respectively. If there are any males in La Ferté's series, and the species here associated with the name is not represented, it will be within the province of a future investigator to reassign the name *interruptus.* The same might also be said of *bilobus,* a Dejean manuscript name mentioned by La Ferté as a color variety of *interruptus. Constrictus* was described without mention of type locality. Since Say spent more time in Indiana and Pennsylvania than in the South, and since he mentions the locality of other species described in the same paper as having been collected on special trips, the choice made here is consistent with the possible type locality. The species chosen is the abundant one in the Middle Atlantic States and the Midwest. *Interruptus* was described from specimens collected in Texas by Pilate. Very few specimens of *Tomoderus* have been seen from Texas and both *constrictus* and *interruptus* in the interpretation of the present author are represented. The one chosen to bear the name *interruptus* is by far the more abundant across the South.

The new species described here seems to be the least abundant of the three externally indistinguishable species. It is, of course, possible that it is the only one represented in La Ferté's series. In this event the name proposed here would become a junior synonym of *interruptus.* The species has not yet been taken in Texas but there is no good reason to suspect that it does not range that far since it is very widely distributed.

There is no area in the eastern United States where only one species of *Tomoderus* would be expected to occur. The apparent exceptions will doubtless disappear when more specimens are examined. At the present time only *inhabilis* sp. n. has been identified from New England. *Constrictus* must occur there as well. It has been taken as far north as northern Wisconsin. Therefore no identifications are possible without males, and the genitalia must be seen before even the males can be identified, except in the case of the more obvious specimens of *impressulus.* Fortunately, only the tip of the genitalia need be examined and the tip is often extruded. Otherwise, the specimen must be dissected. I have found dissection most easily performed by relaxing the specimen in hot water, removing the abdomen and pulling the genitalia anteriorly through the base of the abdomen with fine forceps. The genitalia need not be cleared for the purpose of identification. Males are easily distinguished in a series by the presence of a flattened, semicircular pygidium, which is completely absent in the females, as in all Anthicidae.

The genitalia are asymmetrical, as can be seen in the figures. They are remarkably constant in shape, and even in size, despite some variation in the size of the entire insect. Structurally, they are totally unlike those of any other Anthicidae examined, lacking a recognizable phallobase (basal piece) and possessing a twisted sclerotized structure internally, presumably associated with the internal sac. I have been unable to homologize any of the parts with those of other Anthicidae. The genitalic differences, coupled with the absence of tibial spurs and a very distinctive body form, set off our species of *Tomoderus* so strikingly that it is questionable whether they should be included in the Anthicidae.

There is little reason to expand the description of the genus given by Casey (1895, Ann. N.Y. Acad. Sci. 8:648). The following key to species is based entirely on the male genitalia, since they provide the only completely reliable features for distinguishing species.

1. Genitalia notched near the apex 2
   Genitalia not notched near the apex 3
2. Genitalia very unequally notched near the apex, formed into a hook . . . . *T. interruptus* Laf.
   Genitalia almost equally, and only feebly, notched near the apex . . . . *T. constrictus* (Say)
3. Genitalia slender, slightly expanded just before apex. . . . . *T. inhabilis* sp. n.
   Genitalia thick, tapered and slightly constricted just before apex . . . . *T. impressulus Say.*

Tomoderus interruptus La Ferté

Plate 5, Figs. 2, 6

Tomoderus interruptus La Ferté, 1848, Monographie des Anthicus et genres voisins . . .: 97. LeConte, 1852, Proc. Acad. Nat. Sci. Phila. **6**: 94. Casey, 1895, Ann. N.Y. Acad. Sci. **8**: 648.

Tomoderus interruptus var. γ (*bilobus* Dejean) La Ferté, 1848, *op. cit.*: 98.

Tomoderus abbreviatus Casey, 1895, *loc. cit.* (*lapsus calami* in the key to species).

As here interpreted this is the commonest species in Florida, ranging from there west to coastal Texas and

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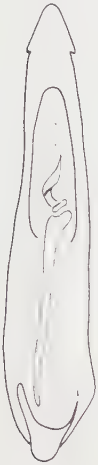
Explanation of Plate 5

Male genitalia of *Tomoderus,* Figs. 1-4 in dorsal view as they lie in the abdomen, Figs. 5-8 the same specimens in lateral view; all figures with the posterior end at the top. Fig. 1. *T. constrictus* (Say), Falls Church, Virginia. Fig. 2. *T. interruptus* Laf., Harahan, Louisiana. Fig. 3. *T. inhabilis* sp. n., Iowa City, Iowa. Fig. 4. *T. impressulus* Csy., Valley of the Black Mts., N. Carolina. Fig. 5. *T. constrictus.* Fig. 6. *T. interruptus.* Fig. 7. *T. inhabilis.* Fig. 8. *T. impressulus.*



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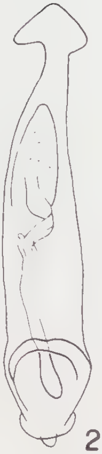

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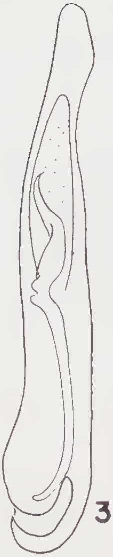

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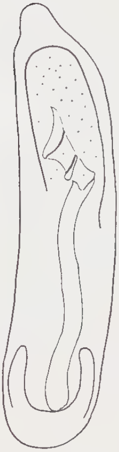

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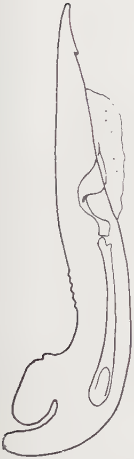

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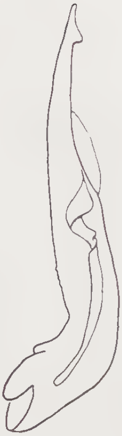

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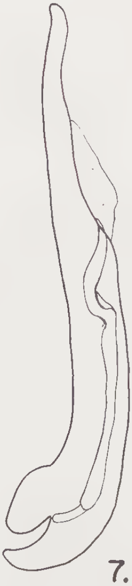

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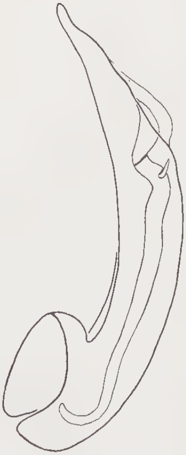

8.

1 mm.

WERNER — TOMODERUS

north in the Mississippi basin to Indiana. La Ferté mentions that the specimens in his collection were collected in Texas by Pilate and that the Dejean collection contained specimens sent by Leconte. Considering the date of the publication, it is most likely that the specimens were sent by the elder LeConte. In this event they most likely would have been collected in Georgia. Both eastern Texas and Georgia are within the range of the species as here understood, although no specimens collected in Georgia have been examined.

Specimens examined have come from the following localities: ALABAMA: Central Mills, Jan. 25, 1928, Woodruff. FLORIDA: Ch. Hbr.; DeLand; Jacksonville, July, 1943, G. S. Hensill; Lake Placid, Mar. and April; Lake Wambirg, Mar.; Orlando, Mar.; Ormond; Sand Pt., Feb.; Winter Park. INDIANA: Vermillion Co., Aug. 17, W. S. Blatchley. LOUISIANA: Harahan, Oct., Nov., 1944, at light, F. Werner; New Orleans, Oct. 23, H. Soltau. TENNESSEE: Memphis, July 3, 1899, Psota Coll. TEXAS: Richmond, Brazos R., June 22, 1917, J. C. Bradley.

Tomoderus constrictus (Say)

Plate 5, Figs. 1, 5

Anthicus constrictus Say, 1827, Journ. Acad. Nat. Sci. Phila. 5: 244.
Tomoderus constrictus, La Ferté, 1848, *op. cit.*: 101. LeConte, 1852, *op. cit.*: 94. Casey. 1895, *op. cit.*: 649.

This is the most abundant species from New Jersey to Virginia, west to Illinois and Arkansas. It ranges more widely than this, from New Jersey to Florida west to northern Wisconsin and coastal Texas. It has not yet been identified from New England.

Specimens examined have come from the following localities: ARKANSAS: Carlisle, Feb., 1891, Stromberg; Jasper, Newton Co., Aug. 21, 1948, at light, W. Nutting & F. Werner; 9 mi. E. Rogers, Benton Co., July 6, 1949, M. W. Sanderson and L. Stannard; Washington Co., Aug. 12, 1939, M. W. Sanderson. D.C. : Blanchard Coll. FLORIDA: Dunedin, Feb. 18, 1929, W. S. Blatchley. ILLINOIS: Galesburg; Oakwood, Oct., ground cover; Putnam

Co., Apr. 9, 1933; Volo, Oct. 7, 1933, Asterlund, moss in bog. INDIANA: Evansville, June 27, 1943, H. S. Dybas; Starke Co., Aug. 14, 1920, W. S. Blatchley. LOUISIANA: Tallulah, P. A. Glick. MARYLAND: Baltimore, Mar. 14. MISSOURI: St. Louis. NEW JERSEY: Arlington, E. L. Dickerson; Emerson, Feb. 3, 1918, Quirsfeld. NEW YORK: Staten Island, Feb. OHIO: Cincinnati; Holgate; Holmes Co., Feb., Mar., Everly; Holmesville, Mar. 24, 1928; Marietta, Nov. 10; Mendon, Mercer Co., Aug.; Salineville, Feb. 4, 1891. PENNSYLVANIA: Angora, June 15, G. M. Greene; Easton, May 4, 1937, J. W. Green. SOUTH CAROLINA: Sumter, Oct. 20, 1926. TEXAS: Lee Co., July, 1912, J. C. Warren. VIRGINIA: Falls Church, Sept. 28, Nov. 18, N. Banks. WISCONSIN: Bayfield Co., Liebeck Coll.

Tomoderus inhabilis sp. n.

Plate 5, Figs. 3, 7

This species is externally almost indistinguishable from *Tomoderus interruptus* and *T. constrictus* as interpreted in the present paper. The antennae tend to be slightly thicker toward the apex than in either of these two species. The following measurements, in 0.01 mm., length over maximum width, from basal to apical segments, show a comparison of the antennae of a male of each of the four species. It has not proven practical to segregate the species on this basis. *Interruptus*: 15/9, 10/6, 11/6, 10/6, 11/7, 10/8, 11/10, 11/10, 11/12, 10/12, 14/12. *Constrictus*: 13/9, 8/6, 9/6, 9/6, 10/7, 10/7, 11/8, 11/9, 10/10, 10/10, 13/10. *Inhabilis*: 15/8, 11/6, 11/6, 10/7, 12/9, 11/10, 11/11, 11/11, 11/12, 10/13, 16/12. *Impressulus*: 15/9, 10/7, 11/7, 10/8, 11/9, 10/9, 9/11, 9/12, 9/13, 9/13, 13/12. Segments VII to X are at least as broad as long in these specimens of *impressulus* and *inhabilis*, while only segments IX and X are as broad as long in the other two species. Even though these differences are not constant enough or striking enough for identification of species, they show up fairly well in a series after the specimens have been identified on the basis of the male genitalia. Except in the case of *impressulus*, where the thickness of the antennae can be associated with other external characters, antennal differences are probably not reliable enough for the identification of female specimens.

The male genitalia are distinctive, considerably more slender than in the other Nearctic species, and slightly expanded on one side near the apex, without any definite notches on the sides. Because they are dorso-ventrally flattened, they are more similar to those of *interruptus* and *constrictus* than they are to those of *impressulus*. The figures should be consulted for comparison.

Inhabilis ranges very widely east of the 100th Meridian, from Massachusetts to Florida, west to eastern Kansas and Arkansas. It has not yet been taken in coastal Texas. Despite the wide range, it has not been found to be abundant at any locality.

Type series: All the specimens designated as types are males in which the genitalia have been examined. Holotype: Homestead, Florida, June, 1929, P. J. Darlington (MCZ). Paratypes: ARKANSAS: 2 Washington Co., Oct. 11, 1939, M. W. Sanderson (INHS and author). CONNECTICUT: 1 So. Meriden, Apr. 9, 1939, H. L. Johnson (Conn. Ins. Surv.). FLORIDA: 2 Alachua Co., Apr. 24, 1948, I. J. Cantrall (U. Mich. and author). 1 Ch. Hbr., A. T. Slosson (AMNH). Enterprise, June 19, Bowditch Coll. (MCZ). 2 Homestead, eutopotypical (MCZ and author). Jacksonville, A. T. Slosson (AMNH). Titusville, Mar. 21/22, 1939, F. E. Lutz (AMNH). GEORGIA: 1 Spring Ck., Decatur Co. Jul. 16-29, 1912 (Cornell). INDIANA: 1 Vermillion Co., Aug. 17, 1921, W. S. Blatchley (Cornell). 1 Vigo Co., May 30, 1907, A. B. Wolcott (Chicago Nat. Hist. Mus.). IOWA: 2 Iowa City, Mar. 25, 1898, H. F. Wickham (MCZ and author). KANSAS: 1 Riley Co., Mar. 13, Popenoe (Kans. State). 2 Topeka, Popenoe (USNM and Kans. State). MASSACHUSETTS: 1 Tewksbury, Sept. 2, 1871, F. Blanchard (MCZ). MISSISSIPPI: 1 Lucedale, Dec. 4, 1930, H. B. Dietrich (Cornell). MISSOURI: 1 St. Louis, Liebeck Coll. (MCZ).

Tomoderus impressulus Casey
Plate 5, Figs. 4, 8

Tomoderus impressulus Casey, 1895, *op. cit.*: 649.

Samples of this species from the southern Appalachians are easily recognizable by their generally dark color, thickened antennae and slightly broader anterior lobe of the prothorax, this lobe having a fine median groove. Samples from other areas are not as obvious. The general color may be paler, the antennae not so obviously thickened and the anterior lobe of the pronotum not canaliculate. Specimens from other areas than the Appalachians are most easily identified by the form of the male genitalia, as shown in the key and figures.

This is apparently the common species in the southern Appalachians but it is apparently rather scarce elsewhere in its range. Specimens have been seen from coastal South Carolina, Virginia, Indiana, Illinois, eastern Kansas and a single specimen from the state of Washington. The combination of the southern Appalachians and Washington in its distribution suggests a relict distribution such as has been noted in some other groups of insects. No other species is known from west of the 100th Meridian in North America. The Washington specimen was taken by G. H. Nelson, an entomologist known for his attention to detail. There can be no question that the locality label is correct.

Specimens have been examined from the following localities: ILLINOIS: White Heath, Piatt Co., Apr. 1, July 20, Sept. 23, Oct. 12, Oct. 29, No. 7, in soil and humus, J. C. Dirks. INDIANA: Vermillion Co., Aug., W. S. Blatchley. KANSAS: Atchison, Apr. 25, H. Soltau; Topeka, Sept. 10, 1942, C. H. Seevers. NORTH CAROLINA: Asheville (type locality); L. Toxaway, A. T. Slosson; Valley of the Black Mountains, July, Sept. 24 and 30, 1900, Aug., Sept. 10-14, 1906, W. Beutenmuller. SOUTH CAROLINA: Florence, Jan. 18. VIRGINIA: Fairfax Co., Sept., Quirsfeld. WASHINGTON: Deep Lake, (Douglas Co.), May 5, 1949, G. H. Nelson.

THE NEST OF AN ANOMALOUS COLONY OF THE ARBOREAL ANT *CEPHALOTES ATRATUS*

BY NEAL A. WEBER

Swarthmore College, Swarthmore, Pa.

One of the distinctive elements of the neotropical ant fauna is the heavily armored and spinose genus *Cephalotes* of forested areas. The workers have powerful, short and convex mandibles that enable them to gnaw out cavities in the trees for nests. Kempf (1951) lists the species *atratus* (L.) from Honduras to Brazil and northern Argentina and summarizes the known biological records. He has also synonymized *quadridens* De Geer with *atratus*. As thus known, the worker is characterized as 8 to 14 mm and black in color and the female about 20 mm and black. The male length is up to 14 mm and with head, thorax and penduncle black, gaster and appendages testaceous to dark ferruginous. Other characters of the castes are fully described by him.

Under the name of *Cephalotes atratus quadridens* the present colony has been alluded to briefly (Weber, 1938, 1947; Wheeler, 1937; Whiting, 1938) and a figure of one of the anomalous workers has appeared (Wheeler, 1936). No account of its biology or nest has hitherto been published. Observations on the colony were initiated on December 11, 1934 and terminated on October 4, 1935, during tenure of a National Research Fellowship in Biology.

It is one of two known ant colonies that contained unprecedented numbers of anomalous individuals. Both were discovered and observed by the writer in Trinidad, B. W. I. and the other (*Acromyrmex octospinosus* Reich) was the subject of the book by Dr. Wheeler (1937). The *Acromyrmex* anomalies were considered by him to be mosaics or gynandromorphs but were later (Whiting, 1938) tentatively characterized as intersexes and intercastes. Dr. Whiting suggested that the *Cephalotes* anomalies, called gynandromorphs by Wheeler, may be female intersexes if not also intercastes. These colonies, which are in the author's collection, need to be restudied and the cause or causes of the anomalies remain obscure.

GENERAL ENVIRONMENT OF THE COLONY

The colony was taken on the savannah grounds (elevation 63 feet) of the Imperial College of Tropical Agriculture in a saman tree (*Samanea saman* ((Jacq.) Merrill) of the Family Mimoseae, a large, umbrella-shaped tree native to Central America. The daily temperature extremes were close to 21-30° C. and annual rainfall some 70 inches.

The tree was separated by 18 meters of well-cropped grassy lawn from the nearest tree, a *Cassia grandis,* to the southwest. The next nearest tree was 48 meters south and was a saman which housed a normal *Cephalotes atratus* colony in a large branch. Another tree, a saman, was 82 meters southwest from the first and lacked a colony of this species. Nine meters south of the latter tree was a saman tree with a normal *Cephalotes atratus* colony. There were no other suitable nesting sites in the area. It was the habit of the ants of all colonies to forage over the grass adjacent to their trees, where some were taken by the giant marine toad, long known as *Bufo marinus* (L.) (Weber, 1938).

THE NESTING TREE

The crown of the saman, fully 30 meters in diameter, had an estimated volume of the order of magnitude of 2000 cubic meters and branches on which the ants were found were up to 15 meters distant from the actual nest site. The leaves were bipinnate and large and closed just before sunset. Early in the dry season (January-May) the tree bloomed and late in February young fruiting pods appeared.

Branches of the tree touched those of the *Cassia* whose trunk was 18 meters from that of the saman. The branches met at a height of seven meters and served as a bridge for the ants. The *Cassia,* also with large, bipinnate leaves, was a young and vigorous tree with smooth bark and appeared with similar but smaller fruiting pods. There was no nesting site available here for the ants.

THE NEST

The original position of the nest was just within the trunk, at the place where a large branch had been sawed off on the north side some 12 years previously and at an elevation of three meters. In the drying of the cut surface an irregular crack had developed that was about 10 mm wide and a few centimeters long. Through this crack the ants gained entrance to an otherwise hard and sound trunk.

The ants gnawed a series of irregular tunnels and chambers in the tough wood, the chambers closest to the outside being some 2-3 cm in, the farthest about 30 cm. There was no regularity in the disposition or size of the tunnels and chambers, the latter being simply enlargements of the former. The nest resembled that of *Camponotus herculeanus* except that the alternating hard and soft layers of wood in northern trees were absent from this tropical wood and there were therefore no concentric excavations.

After the nest was excavated on March 3, April 27 and June 21 the surviving ants took refuge in the innermost tunnels. The wood here was so hard and tough that the ants eventually left it and for a month there was no indication of another site. Finally, on July 28, a worker was detected shortly before sunset crawling to an inconspicuous hole in a small branch at a point 10 meters distant from the trunk and three meters above the ground. The branch was 6 cm in diameter. A mass of ants of all castes was found in a cavity here that was about 20 x 2-4 cm. The opposite end of the cavity terminated in a small tunnel a few millimeters in diameter which was too small for a male or female ant but suitable for a small worker. The ants had either made this cavity or enlarged that of an *Azteca* colony.

During the next two months eleven more auxiliary nests were found. The size varied considerably and all were in dead stubs of branches or in live wood. The mandibles of the workers were small and much time was required to excavate. Some freshly excavated cavities contained scarcely a score of brood and with room only for a few workers. No auxiliary nests were formed in the *Cassia* tree.

AREA PATROLLED BY THE ANTS

The entire crown of the saman was available to the ants. They crawled over every main branch and were frequently found on the most remote smallest twigs and leaves. They occasionally foraged over the grass at the base of the tree but not more than 3-6 meters away from it. The *Cassia* tree was also used, the ants gaining access over the long bridge formed by the intermingled branches. To prove that the ants were from the saman colony, workers on the saman were marked with yellow paint on the thorax, those on the *Cassia* trunk were marked on the gaster. One from the latter site was recovered later on the saman at a point where it had to traverse a minimum distance of 32 meters, whether by the grass route at the base of the trees or by the aerial bridge. Another ant was recovered a similar distance away on the saman. Marked ants from the saman were later taken at the base of the *Cassia* tree and on the *Cassia* at the aerial bridge site. Other *Cassia* ants were recovered in saman nests.

The total volume of foliage used by the colony was thus well in excess of the 2000 cubic meters of the saman crown and approached the volume of soil used by a large *Atta* colony. The area patrolled was not computable on the same basis as that of a terrestrial ant but ants of the colony were taken some 50 meters distant from each other, an indication of the diameter of the area.

THE COLONY

A. THE FEMALE

The female was discovered on April 27 after hours of chiselling into the hard wood on March 3 and later. She was in a small cavity with eggs and minima larvae and was removed to an observation nest, together with a few media workers firmly clinging to her and some other workers and brood. Within two hours she laid nine eggs. The workers assisted with egg-laying. As an egg would slowly emerge a worker would grasp it and pull it away. She continued to lay eggs for two days; one laid on the 29th took 15 minutes to be completely extruded. On the 30th at 8:05 a.m. she was found to be lying on one side, with legs folded. The workers were licking her body and pulling her about. She showed no movements when she was isolated under the microscope, except of the terminal pair of gastric segments. These were rhythmically opening and closing the cloaca, an early cycle taking 20 seconds, later cycles taking longer. One lasted 25 seconds and consisted of 10 seconds of opening and 15 seconds of closing. The segments opened to a maximum of 0.7 mm which was easily equal to the length of one of her eggs. Twenty seven minutes after she was discovered in this condition the movements appeared to be in the nature of a retching and they later slowed down. Within three hours the cloaca was open more than it was closed and she was then returned to the observation nest. The workers immediately approached, explored her with their antennae, and licked her thoroughly as before. By 1 p.m. her terminal segments were still moving and an hour later she was preserved in 80% alcohol, where she floated despite an opening made in her gaster to allow the penetration of the fixative. Later sectioning showed that the ovary was normal and contained many eggs in all stages of growth. There was no sign of a double or binucleate egg.

All evidence pointed to the existence of the single female as the progenitor of this large colony. Her age probably dates from some time after the branch of the tree was cut off, 12 years earlier.

B. BROOD

Eggs, larvae and worker pupae were found on the first occasion of opening the nest on March 3 and up to August 5. Soon after April 27 the ants largely abandoned the original nest site.

Media larvae were taken on September 15 and maxima to the 25th. Male pupae were taken on June 21 and were not again found until September 19 to 25. Adult males were taken June 21 — August 5 and two on September 25.

Alate females were found on July 28 and one on August 5. The September brood probably was the result of unfertilized eggs laid by the workers; some of these had fully developed ovaries containing eggs. The brood maturing through August 5 was probably from eggs laid by the queen up until her capture on April 27. The data suggest a maximum period of development from egg to worker of between 100 and 141 days and comparable periods for the sexual castes.

The first part of the worker pupa to take on the adult coloration was the eyes, as in *Cryptocerus varians,* then the tarsal claws and apices of the large spines and gaster. The head and thorax become black last. The pupa may move its legs and other appendages slightly when it is still a pale yellow in color. The pupa is aided from its white envelope by the adult workers licking and using the mandibles to pull at it. A callow worker, gray in color, could walk fairly fast when the nest was exposed in July.

FOOD OF THE ANTS

The main source of food for the colony throughout the months of observation was the secretions of the membracid, *Adippe inconspicua* Fowler. From February through July these insects were on the fruiting pods of the saman and were being constantly tended by the ants. As the pods in most cases were many meters from the nest sites, much time must have been consumed by these slow-moving ants in travelling back and forth from the feeding areas. While the pods were young and succulent they bore large numbers of *Adippe* and their secretions at this time appeared to be particularly important as a source of ant food.

Workers that were foraging on the grass at the base of the tree gathered bird feces containing insect remains. Others dismembered a large, naked caterpillar lying freshly killed in the grass. The ants were often found to carry indeterminable bits of food but were at no time seen to carry recognizable plant remains.

MYRMECOPHILES AND PREDATORS

The entire absence of myrmecophiles in this large colony is noteworthy. Other common ants of the area that had a comparable colony size had a varied myrmecophilous fauna. Two phorid flies hovered over the nest while the brood collection of April 27 was being made and one apparently tried to ovoposit on a worker but both soon left. The integument was probably too dense for these parasites. On May 21 five workers were found in a motionless mass at the base of the tree under their nest. They were placed in a moist container to determine whether parasites would emerge but none did.

The marine toad, as noted before, fed on these ants and was the only predator observed. The stomachs of several ant-eaters (*Tamandua longicaudata* and *Cyclopes pygmaeus*), taken from nearby trees, did not contain remains of these ants.

GENERAL BEHAVIOR

The behavior of the workers underwent a marked change during the months of observation and collecting and seemingly as a result of this "persecution." At first they were aggressive, swarming over the hands and biting repeatedly. Their small mandibles could only pinch the human epidermis. Some workers fled but none freely dropped off the tree. Those which dropped off to the ladder or the clothes immediately climbed to where they could bite the exposed skin.

During July and early August they lost their aggressiveness to a large extent. By this time there were much fewer individuals and stimulation of one another would be reduced. Nevertheless, when a mass of workers would be encountered, as in exposing an auxiliary nest, the ants seldom attacked but fled.

By September the ants were so timid that, when one would be approached, it would instantly release its hold on the branch and drop to the ground from any height. It was noteworthy how often in their fall they might catch hold with their tarsal claws of a leaf, twig or hair on one's arm as they brushed by. The ants freely dropped off though one's fingers might be 15 cm. from them. Those that did not drop off ran quickly to the underside of the branch. When the nests were exposed the ants remained motionless, appressed to the branch, or fled.

On September 14, 3:30 p.m., several small groups of ants were resting quietly on main branches of the *Cassia*. Their mandibles were not moving and they were not feeding. Aggregates like this at this time of day were not seen when the colony was larger: On October 2 a cluster of 31 was on the sunny side of the *Cassia* trunk at 8 a.m. They were watched for half an hour and showed no tendency to leave or to feed. For the most part they remained motionless but occasionally one would change position. On both dates the ants instantly dropped off when they were approached with the fingers.

At all times of the year activity outside the nest ceased shortly before sunset, when the saman and *Cassia* bipinnate leaves folded and drooped down, and was resumed at dawn.

Behavior with Brood and Membracids

When the brood was exposed during the first months many of the workers tried to carry it away. There was no division of labor on the basis of worker size or normal or anomalous morphology. An egg or small larva would be held by the middle, between the mandibles, and carried under the massive head. A larger larva or a pupa, however, would be grasped tightly towards one end and carried vertically in front of the worker or even inclined over the back. The workers assisted the callow from its pupal case by cutting this with their mandibles as noted earlier. When the brood was exposed in later and smaller auxiliary nests the same behavior was noted despite the change in aggressiveness.

The membracids were not defended nor taken away by the ants when attempts were made to collect both. At all times, when feeding membracids and ants were approached, the ants and the adult female membracids fled, the latter taking flight, while the nymphs were left unguarded.

Behavior of Anomalies

The anomalous workers behaved as normal workers. They were aggressive when the rest of the colony was aggressive and fled when the others fled. Those most conspicuously anomalous were the maxima and these were nearly all collected in the first few months. They carried food to the nest, aided in dismembering a caterpillar and tended membracids. One with worker body and male genitalia stroked a membracid as would a normal worker; other anomalies were frequently on the pods. They carried brood, when the nest was disturbed, like normal workers. The anomalies also licked the female integument in the observation nest, a typical worker habit.

Anomalies with one or both of the curious ram's horn antennae (as in Wheeler, 1936, Fig. 1) were able to pursue a direct course and no clear asymmetry in motion was observed. The winged and apparently female anomalies behaved as did the workers and either bit quickly and repeatedly or fled.

The males, which were superficially normal, were uniformly timid, did not bite and either attempted flight or concealment.

NUMBERS IN THE COLONY

Systematic collection of the colony was undertaken when the colony was discovered to be anomalous. By June 21 the totals were:

Apparently normal worker adults —	7284
” ” pupae	885
Anomalous worker adults	2919
” ” pupae	201
Adult males	94
Male pupae	48
Queen	1
	11432

The July and later collections added 19 alate females, including eight anomalies, and several hundred workers.

SUMMARY

A nest of the arboreal ant, *Cephalotes atratus* (L.), contained over 10,000 adults during a 10-month period of collecting. The workers at first were aggressive and

attacked freely. Later, apparently as a result of the systematic search and collecting, the ants became timid, dropping from the tree or running to the opposite side of the branch when approached. Finally the remainder formed on another tree into temporarily immobile small clusters. These remnants of an aggressive colony lacked the stimuli of the queen, brood and other workers that might be necessary to maintain their normal behavior. The colony was also noteworthy in containing large numbers of anomalies whose cause remains obscure.

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SOME NEW SPECIES OF ROBBER FLIES
(DIPTERA: ASILIDAE)

By Frank M. Hull

University of Mississippi

Recent studies of Diptera have brought to light several undescribed species of Asilidae, which are here described.

Laphystia torpida, new species

A stout species of medium size. The abdominal pattern is superficially like that of *Laphystia annulata*, new species, but the femora and tibiae are chiefly black. Length 10 mm.

Female. *Head*: The head is black, the face is covered with dense, pale, yellowish grey, nearly white, fine micropubescence. Similar cover is found on the front, vertex and upper occiput. The pollen of the lower occiput is more nearly white and its pile fine, rather dense and whitish. There is a cluster of 6 or 7 weak, yellowish white bristles on the upper fourth of the occiput on each side. The low but wide ocellarium bears numerous, erect, stiff, yellowish hairs which are confined chiefly to the side slopes. Proboscis and antenna black, the former not quite extended as far as the face and robust, obtuse, with medial ridge, slightly swollen base and scattered, long, yellowish white hairs at the base below and a rather dense tuft of similar hairs at the apex. The black of antenna is covered by a pale, yellowish grey or nearly white pubescence of microscopic character and the first segment bears a slender, whitish bristle and abundant, whitish pile. *Thorax*: The thorax is black, upper pleuron and the lateral mesonotum are densely covered with pale, brownish yellow pollen, becoming more greyish white ventrally on the pleuron. There is much coarse, yellowish white, long, stiffened hairs on the posterior half and upper border of the mesopleuron and the anterior sternopleuron, besides more scanty pile on the pteropleuron and posterior hypopleuron. There is a broad, vertical band of slender, long, bristly, pale hairs on the metapleuron. Middle of mesonotum densely pollinose and slightly more brownish and still pale. Before and after the suture on each side there is a short, narrow, more or less bare stripe which may be natural or worn. Posterior margin of scutellum also bare and black. The disc densely pale pollinose with abundant, coarse, appressed, pale yellowish pile and similar pile in front of the scutellum. On the greater part of the mesonotum the pile is scanty, minute, flat appressed and golden. Down the middle anterior area is a slightly darker, greyish brown vitta, which is divided by a pale, narrow stripe. *Legs*: The legs are black, largely pale grey pollinose, the pile short, coarse, appressed, brassy and glittering. The bristles are weak, yellowish white and moderately numerous and short, except on the anterior and middle tibiae where they make long, spike-like, regularly spaced fringes. The extreme base of the anterior and middle femora and slightly more of the hind femoral base light reddish brown. All the tibiae narrowly and obscurely light brown at base. All the tarsi quite dark brown. Hind femur with 6 lateral bristles, 4 or 5 ventrolateral bristles and some ventromedial, bristly hairs and broadly covered ventrally with abundant, fine, short, erect, pale pile continued on to the ventral surface of the hind tibia. Hind tibia with moderately long bristles: 4 dorsolateral and 4 ventrolateral elements, their basitarsi robust. Middle femur with 1 long, anterior and 1 short anteroventral bristle, each close to the middle, 1 short, posterior bristle near the apex and 5 or 6 long, slender, basal and ventral bristles and numerous bristly hairs on the ventral surface. Middle tibia with 3 anteroventral bristles, 3 anterodorsal, 4 posterodorsal, 4 long, slender, posteroventral hairs and 4 conspicuous, long, evenly spaced, ventral bristles. Anterior femur with a slender, short bristle anterodorsally near the apex, the ventral compliment similar to the middle pair and no other bristles. Anterior tibia similar to the middle tibia and the conspicuous fringe in this case consists of 5 long, posteroventral bristles. Claws slender, uniformly and gently curved from the base, sharp. Pulvilli on all legs reduced to less than half the length of the claws. Empodium long and flattened. *Wings*: The wings are greyish hyaline. There is a minute stub near the base of the anterior branch of the third vein. First posterior cell a little narrowed, marginal cell widely open, fourth posterior cell and anal cell each closed with a long stalk. Alula well developed, ending at the apex of the anal cell. Alula large. *Abdomen*: The abdomen is black, dully shining, wider than the thorax, widest on the third segment, the posterior third of each tergite or a little less is densely clay colored pollinose and nearly the same shade as the mesonotum. The pollen extends completely and widely over all the lateral margins except for a narrow triangle at the base of the second segment. Pile scanty, flat appressed and brassy. Sides of first tergite with a patch of weak, yellow bristles and other pile. Middles of lateral margins of second tergite with a transverse row of 7 or 8 short and more stout, pale bristles. Third tergite with 5 such bristles; fourth with 4, fifth and sixth tergites with 2 such bristles. The minute ninth segment is dull black; seventh and eighth segments quite short.

Type. Female; Tracy, California, San Jouquin County, June 13, 1949, J. W. McSwain collector. Type in the collection of the University of California.

Laphystia annulata, new species

A small species which traces to *Laphystia confusa*. It is characterized by the dense, silvery grey pollen, the black antenna, the pale yellow femora and tibiae, the latter being quite narrowly black at the apex. Length 9 mm.

Male. *Head*: The head is black, everywhere silvery white pollinose with long, dense, silvery white, fine hairs on face, front, occiput, vertex and ocellarium. Upper corners of the vertex with 6 or 7 white bristles on each side. Proboscis shining black. Antenna black, its pile white. *Thorax*: The thorax is black, densely greyish pollinose on the pleuron, changing on the upper mesopleuron to a faint yellowish hue. Pollen of mesonotum faintly yellowish, the pile minute, appressed and pale brassy yellow, except for a collar of nearly erect, longer, white hairs anteriorly between the humeri. Bristles of lateral margins yellowish white and weak; 2 on notopleuron, 4 above wing, 2 on post callus and the scutellar margin with 4 pairs of slender hairs. *Legs*: The whole of the femora and all of tibiae except extreme apex and the extreme base of the basitarsi yellowish. Remaining tarsi blackish. Pile appressed and white or yellowish white. Bristles weak, short, except on the anterior and middle tibia, few in number and of the same color as the pile. Claws fine, sharp, black with the basal third yellowish. Pulvilli pale, thin, well developed. *Wings*: The wings are nearly hyaline, the second vein and the third vein on the basal part yellow, other veins light brown. Marginal cell open though narrowly. *Abdomen*: The abdomen is shining black. All of the first segment except the narrow posterior margins greyish white pollinose. Similar pollen covers approximately one-half of the second and third segments, being slightly decreased submedially and slightly increased in the middle and laterally widely covering the whole lateral margin. On the fourth and fifth and sixth segments a little less than half of the segments are covered by this band. Also the posterior margin of the second and fifth segments narrowly black except laterally. Pile appressed, setate, short and reddish yellow on the black portions, shining white on the pollinose portions. Terminalia short and black with white pile.

Female similar to the male.

Type. Male; near Navajo, Arizona, July 11, 1954, F. M. Hull collector. Allotype, female, 9 paratype males, 2 paratype females, all with the same data. In the collection of the author.

Laphystia annulata interrupta, new subspecies

Similar to *Laphystia annulata*, new species but with the grey bands on the abdomen distinctly interrupted, each half attenuate so that also more of the posterior margin is shining black.

Type. Female; near Navajo, Arizona, July 11, 1954, F. M. Hull collector. In the collection of the author.

Laphystia rubra, new species

A small species distinguished by the uniformly shining, dark red abdomen and the almost entirely brownish yellow femora. Length 8 mm.

Female. *Head:* The head is black. Face laterally with silvery, minute, appressed pubescence, brownish yellow in the middle on the upper half; the mystax consists of 2 or 3 rows of short, stout, brownish yellow bristles above the epistoma. There are a few fine, white hairs on the upper part of the face laterally which are not very long and appressed. First 2 segments of antenna black, the third brownish black, the first segment with 2 long and 1 short, stout, brownish yellow bristle below. Front in the middle with pale brownish yellow pollen, the sides more whitish. Upper front and medial part of the vertex adjacent to the eye with a few, short, stiff, brownish yellow setae. Occiput with fine pile except above, where there are 7 pairs of slender, reddish yellow bristles. *Thorax:* The thorax is black, pleuron thinly dusted with yellowish white pollen and a few long, yellowish hairs on the mesopleuron. Metapleuron with a vertical row of 12 quite slender, pale yellowish hairs and a few other short hairs. Mesonotum with abundant, minute, flat appressed yellow setae. Bristles brownish yellow, 2 on notopleuron, one of which is quite small, 2 above wing, 2 on post callus, 1 of them small, and scutellar margin with only a few minute, upturned setae. Scutellar disc likewise with a few appressed, brownish golden, minute setae directed outward. Knob of halteres yellow, the base reddish brown. *Legs:* The femora are brownish orange with an obscure, dark streak on the dorsal surface of the hind femur confined to the outer half. A smaller, distal, dorsal, obscure, dark patch on the anterior femur and a trace of such color distally on the middle femur. Apical fourth of all tibiae obscurely brownish black. All tarsi quite dark brown. Pile of legs minute, appressed, pale brownish yellow and setate. Bristles weak, pale and few in number. There is a whitish bristle ventrally near the base of the hind femur and sometimes a second smaller bristle a little beyond it. Each femur has near the apex a small posterior or medial bristle. Each femur has a still smaller yellow bristle laterally near the apex. Claws slender, black, with the base reddish. Pulvilli slender, long and whitish. *Wings*: The wings are nearly hyaline, the second vein and the basal part of the third vein pale brown, other veins light brown. Marginal cell open narrowly. *Abdomen*: The abdomen is more robust than in *Laphystia annulata*, new species. Tergites dark, shining, brownish red with the whole lateral margins only pale brownish yellow pollinose. This pollen extends narrowly along the posterior margin of the sixth tergite but leaves the middle interrupted and bare. The short seventh and eighth tergites entirely pollinose. Pile over the middles of the tergites minute, flat appressed and reddish yellow. Side margins of first segment with 4 stout, reddish bristles and the second and third segments with 4, the fourth segment with 3 and the fifth and sixth segments each with 2 similarly colored bristles.

Type. Female; near Navajo, Arizona, July 11, 1954. Paratype female, same data. F. M. Hull collector. In the collection of the author.

Sympatry of The Ants Conomyrma bicolor (Wheeler) and C. pyramica (Roger). — In his revision of the North American ant fauna Creighton (1950, Bull. Mus. Comp. Zool. Harvard, 104: 349) treats *C. bicolor* as a sympatric subspecies of *C. pyramica,* on the grounds that the two forms are separated ecologically where they occur in proximity. Kusnezov (1952, Acta Zool. Lilloana, 10: 430), on the basis of purely morphological criteria, raises *bicolor* to species rank, even placing it in a separate subgenus, *Biconomyrma.* A recent re-examination of the *pyramica* group has cast some doubt on Kusnezov's decision, however, since it has been found that *bicolor* does not possess the characters reputed to exist in the worker alitrunk of *Biconomyrma* species. It is therefore noteworthy that there is at least one locality where the two forms occur in intimate sympatry while remaining distinct with respect to characters in worker color and size. In Kingman, Mohave Co., Arizona, during July, 1952, the author found four places inside the town limits where *bicolor* and *pyramica* nests were located within several feet of each other. The *pyramica* nests were outnumbered by those of *bicolor* by a ratio of two or three to one and were restricted to the best watered and shaded spots. They could be distinguished easily by their smaller entrance holes and smaller, more regularly formed craters. No difference in periodicity of foraging was detected. In well shaded spots both species were active to some extent throughout the day, but were inactive and absent from the upper parts of the nests in exposed, sunny spots from about 11:00 a.m. to 3:30 p.m. These data suggest that *bicolor* and *pyramica* are distinct biological species. — E. O. Wilson, Biological Laboratories, Harvard University.

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